Traffic Impact Study

Ravens Crest Developments
Traffic Impact Study - FINAL

Prepared By:

Delcan
TRANSPORTATION • INFORMATION TECHNOLOGY • WATER

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APPENDICES

1.0 INTRODUCTION

1.1 Background

Delcan has been retained by Ravens Crest Developments to conduct a Traffic Impact Study (TIS) for a phased series of developments served by Pemberton Farm Road within the Village of Pemberton. Pemberton Farm Road is accessed via Highway 99 at an existing stop controlled "T" intersection.

Previous planning studies (Ivey and Mosquito Lake Development, KWL, June 2009) have established potential servicing requirements for development as envisioned in the Pemberton and Area Sub-Regional Land Use Planning Study. The subject study focuses on the transportation requirements of the initial stages of development on the Ravens Crest Properties with consideration for future long term development.

1.2 Description of Development

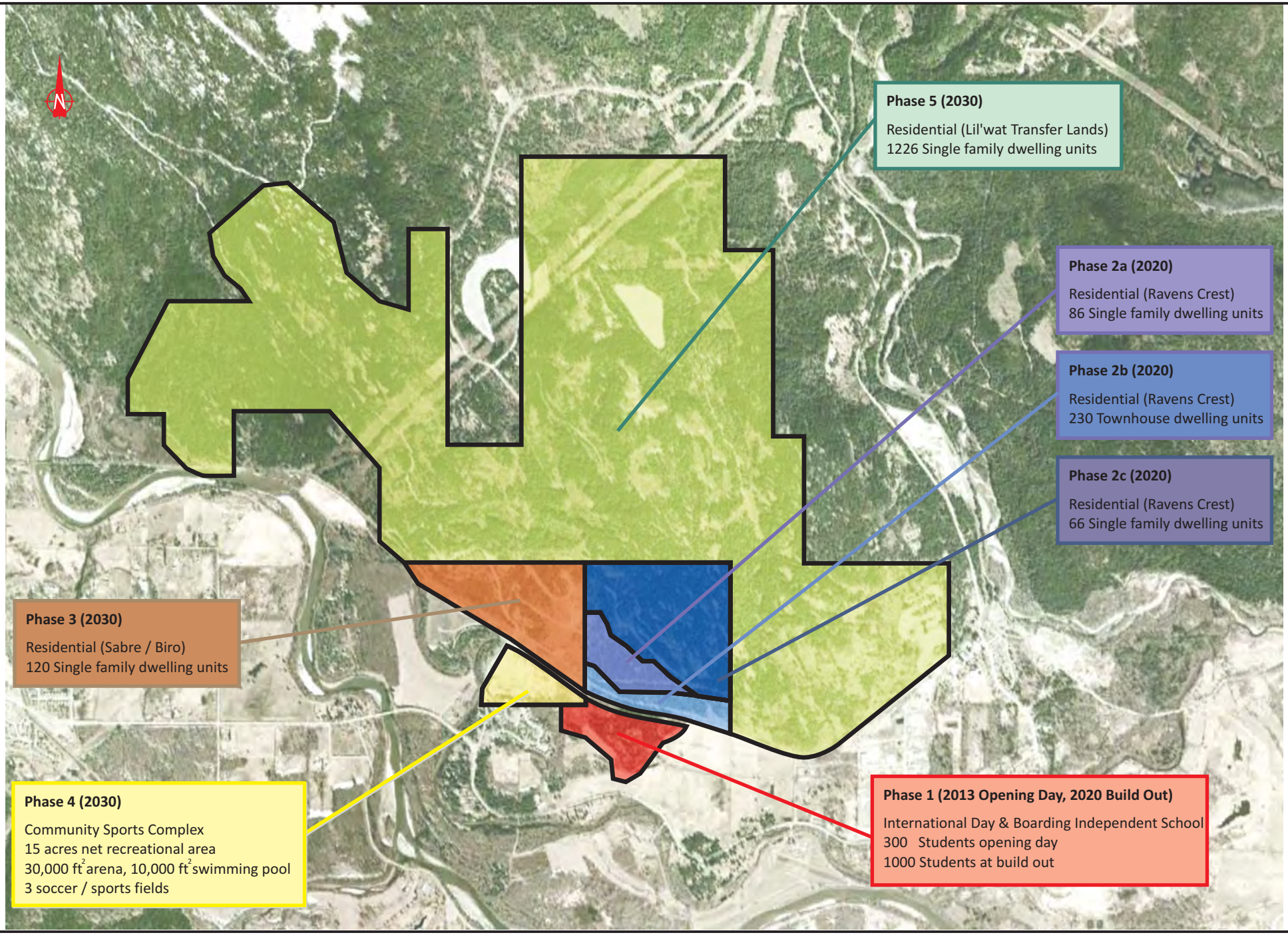
A number of individual developments are proposed in a phased manner. ***Table 1*** summarizes the individual components of the broader area plan while ***Figure 1*** shows the individual development components in their local context.

The density, land use and phasing timelines are based on the most recent assumptions provided by Ravens Crest Developments and are subject to change.

Table 1: Development Phasing Summary

Phase	Independent Variable	Land Use	Assumed Timeline
1	1,000 students at build out (300 opening day)	International Day & Boarding Independent School	2013 opening day, 2020 build out
2a	86 single family dwelling units	Residential (Ravens Crest)	2020
2b	230 townhouse dwelling units	Residential (Ravens Crest)	2020
2c	66 single family dwelling units	Residential (Ravens Crest)	2020
3	120 single family dwelling units	Residential (Sabre / Biro)	2030

Phase	Independent Variable	Land Use	Assumed Timeline
4	15 acres net recreational area, 30,000 ft2 arena, 10,000 ft2 swimming pool. 3 soccer / sports fields.	Community Sports Complex	2030
5	1,226 single family dwelling units	Residential (Lil'wat Transfer Lands)	2030



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Development Areas and Context

Figure 1

Access to the development sites is assumed to be via Pemberton Farm Road only. For Phase 1, access has conceptually been developed at Pemberton Farm Road approximately 100 m south of the existing east-west CN Rail line.

1.3 Scope of Work

As confirmed with Ravens Crest and the Ministry of Transportation, the scope of work for the subject Traffic Impact Study includes the following items:

- Review previous planning studies and collect AM and PM peak turning movement data at the Pemberton Farm Road / Highway 99 intersection;
- Confirm existing peak hour levels of service and identify any deficiencies in operations at the Pemberton Farm Road / Highway 99 intersection;
- Based on the development forecasts for each of the horizon years (2014, 2020 and 2030) generate peak hour site traffic and assign it to the area road network;
- Review the forecast peak hour levels of service and identify any improvements required to accommodate each horizon year's development traffic;
- Review and refine the Phase 1 site concept plan and its internal / external circulation layout;
- Develop a mitigation matrix for each phase of development identifying changes required and the timelines for implementation; and
- Prepare a TIS report for submission to Ravens Crest and the Ministry of Transportation

2.0 STUDY AREA AND ROAD NETWORK

The study area is immediately north of the Village of Pemberton centre within and adjacent to Agricultural Land Reserve (ALR) property.

The primary road transportation network includes the following facilities:

HIGHWAY 99

This primarily two-lane, undivided provincial highway travels north-south from Whistler to Lillooet and is on an east-west orientation as it passes the study area. The speed limit is currently 80 km/h east of Harrow Road. Passing is prohibited through the

Pemberton Farm Road intersection and shoulders are available on both sides of the road (approximately 0.5 to 1.0 m).

The Pemberton Farm Road / Highway 99 intersection is lighted, with an eastbound left and westbound right-turning lane. The Pemberton Farm Road approach is stop controlled while right-turns to and from Highway 99 are yield controlled and channelized.

PEMBERTON FARM ROAD

This two-lane local roadway is undivided and does not provide for shoulders or sidewalks. The speed limit is assumed to be 50 km/h.

Pemberton Valley Transit provides transit services between downtown Pemberton and the Xit'Olacw Subdivision via Highway 99 on Route 100. A stop is located at the Pemberton Farm Road / Highway 99 intersection. Only 7 trips per day are provided. From downtown Pemberton, a transfer can be made to the Whistler Commuter service.

3.0 EXISTING TRAFFIC CONDITIONS

3.1 Traffic Volumes

Existing traffic volumes on the study area road network were obtained through turning movement data collected by Delcan staff in July 2011. Note that historic permanent count data available from the Ministry of Transportation indicates July is a peak month for Highway 99 traffic volume. Peak hour turning movements are graphically summarized in ***Figure 2*** and the raw traffic data collection sheets are provided in ***Appendix A***. ***Table 2*** summarizes the representative link volumes rounded to the nearest five vehicles.

Table 2: Existing Representative Link Volumes (2011)

Link	AM Peak (vph)		PM Peak (vph)	
	Peak Direction	2-Way Total	Peak Direction	2-Way Total
Highway 99 west of Pemberton Farm Road	150 WB	270	260 WB	490
Highway 99 east of Pemberton Farm Road	125 WB	240	235 WB	435
Pemberton Farm Road north of Highway 99	30 SB	40	30 NB/SB	60

The above representative counts indicate the study area roads are operating within their accepted capacities for major road network elements. Heavy vehicles (including trucks and recreational vehicles) accounted for up to 10% of peak hour volume on Highway 99.

3.2 Levels of Service

Based on the most recent available traffic counts, intersection geometry and traffic control, a capacity analysis was undertaken using the SYNCHRO 6.0 program. ***Table 3*** summarizes the results. Detailed capacity analysis calculation sheets are included in ***Appendix B***. The LoS ratings are based on the highest movement delay for unsignalized intersections. For unsignalized intersections an LoS of better than D is desirable, but not always achievable given practical constraints.

Table 3: Existing Intersection Operations (2011)

Intersection	AM Peak			PM Peak		
	Maximum approach delay (s)	Max. Volume to Capacity Ratio	LoS (based on maximum delay)	Maximum approach delay	Max. Volume to Capacity Ratio	LoS (based on maximum delay)
Highway 99 / Pemberton Farm Road	9.3	0.09	A	10.7	0.19	B

As shown in ***Table 3***, the Highway 99 / Pemberton Farm Road intersection currently operates at a good level of service with minimal delays.

3.3 Recent and Projected Traffic Growth

The Village of Pemberton and the surrounding Squamish Lillooet Regional District (SLRD) are growing at a sustained pace. According to BC Stats, the SLRD has grown at approximately 1.6% per annum over the last ten years. Forecasts to 2036 indicate an average growth rate of 1.8% per annum could be sustained.

This is partially reflected in Average Annual Daily Traffic (AADT) volume growth on Highway 99 north of Whistler. From Ministry permanent counts dating to 2002, traffic growth has averaged a 0.5% increase per annum.

For the purposes of the subject study, it has been conservatively assumed that traffic growth along Highway 99 will increase at 2% per annum. This will account for growth outside of the subject Ravens Crest and surrounding properties.

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Existing Traffic Volumes

Figure 2

4.0 TRAFFIC GENERATION, DISTRIBUTION AND ASSIGNMENT

4.1 Traffic Generation

Given the unique nature of many of the proposed developments, a number of sources were referenced for traffic generation rates. The standard industry rates (from the Institute of Transportation Engineers) are discussed first, followed by potential adjustments to the standard rates.

For the International Day and Boarding School, no analogous land uses are available for reference in the ITE Traffic Generation Handbook. The closest land uses would be Junior / Community College (Land Use 450) and Private School K-12 (Land Use 536). While both land uses show a small sample size, the Private School was deemed more relevant with the application of a trip reduction factor of 70% to account for the percentage of students that will be boarded on-site. The recreational community centre has been assigned a trip rate proportional to its gross building floor area (Land Use 495), with a supplemental trip generation rate for the three soccer fields (Land Use 488), which are typically not accounted for in a standard recreational community centre trip generation rate. For residential uses, the standard ITE rates for single family (Land Use 210) and townhouse units (Land Use 230) were applied. Proposed trip generation rates are summarized in ***Table 4.***

Table 4: Trip Generation Rates

Phase	Independent Variable	ITE Land Use Code	Trip Rates			
			AM Peak Hour		PM Peak Hour	
1	300 to 1,000 students (70% boarding on-site)	536 – Private School K-12 (reduced by 70% to reflect on-site boarding)	0.24 / student	61% in	0.16 / student	40% in
2a	86 dwelling units	210 – Single Family Detached Housing	0.75 / DU	25% in	1.01 / DU	63% in
2b	230 dwelling units	230 – Residential Condominium / Townhouse	0.44 / DU	17% in	0.52 / DU	67% in
2c	66 dwelling units	210 – Single Family Detached Housing	0.75 / DU	25% in	1.01 / DU	63% in
3	120 dwelling units	210 – Single Family Detached Housing	0.75 / DU	25% in	1.01 / DU	63% in

4	40,000 ft2 building area (3 soccer / sports fields)	495- Recreational Community Centre	1.62 / 1,000 ft2 (1.40 / field)	61% in (50% in)	1.64 / 1,000 ft2 (20.67 / field)	29% in (69% in)
5	1,226 dwelling units	210 – Single Family Detached Housing	0.75 / DU	25% in	1.01 / DU	63% in
Note: the site trip generation rate selected is the rate corresponding with the peak hour of adjacent street traffic where available						

Using the relationships in ***Table 4*** above, ***Table 5*** summarizes the total traffic generation for each phase and horizon year.

Table 5: Total Trip Generation

Phase	Development	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
1	300 to 1,000 student International Day & Boarding Independent School	44 146	28 94	72 240	19 64	29 96	48 160
2013	*Sub-Total*	*44*	*28*	*72*	*19*	*29*	*48*
2020	*Sub-Total*	*146*	*94*	*240*	*64*	*96*	*160*
2a	86 single family dwelling units	16	48	64	54	32	86
2b	230 townhouse dwelling units	17	84	101	80	40	120
2c	66 single family dwelling units	12	38	50	42	25	67
2020	*Sub-Total*	*45*	*170*	*215*	*176*	*97*	*273*
3	120 single family dwelling units	22	68	90	76	45	121
4	Community Sports Complex & 3 Sports Fields	39 2	26 2	65 4	19 43	47 19	66 62
5	1,226 single family dwelling units	230	689	919	780	458	1,238
2030	*Sub-Total*	*293*	*785*	*1078*	*918*	*569*	*1487*

4.2 Traffic Distribution

Distribution of new site-generated traffic volume was derived from prevailing traffic distribution patterns at Pemberton Farm Road / Highway 99, as well as, a review of regional population and employment distribution.

The broader commuter peak distribution was based on information from Statistics Canada's Place of Work survey which indicates that of the 1,495 labour force in Pemberton, approximately 10% work at home and over 40% work in a different municipality.

For residential components of development, the distribution is estimated as follows:

- 40% to/from the west via Highway 99 (to Squamish / Whistler);
- 10% remain internal to the development (work at home);
- 10% to/from the east via Highway 99 (to Lillooet, Mt. Currie and the Pemberton Industrial Park
- 40% to/from the west via Highway 99 (to downtown Pemberton)

100%

For the Institutional and Recreational components of the development, it has been assumed the distribution is reflective of the local population base, as this is where students, instructors and recreational facility users will be drawn from.

A 90% / 10% west / east distribution has been assumed for the non-residential development components.

5.0 PROJECTED TRAFFIC CONDITIONS

The subsequent analysis determines the levels of service at the study area intersection under a series of phased development scenarios. For each phase, site-generated traffic is superimposed onto base year conditions (2013, 2020 or 2030) which have been adjusted by the appropriate growth factor reflecting a 2% per annum growth rate. Detailed capacity calculation sheets are included in ***Appendix D***. If acceptable performance could not be achieved, physical modifications were identified and/or traffic signal warrants were reviewed (see ***Appendix E***).

Truck percentages were assumed to remain constant throughout the study period. The 2013 and 2020 peak hour factors were assumed to remain unchanged from existing conditions. However, 2030 traffic patterns are expected to vary significantly from existing conditions, thus a Synchro default peak hour factor of 0.92 was assumed.

5.1 Phase 1: Site Plus Background Growth to 2013

Phase 1 accounts for the development of the International Day and Boarding School by 2013 with 300 students. Background traffic on Highway 99 has been factored up by 1.04 reflecting two years of growth at 2% per annum. Site-generated traffic volumes for Phase 1 are graphically illustrated in ***Figure 3*** and total projected traffic volumes are shown in ***Figure 4***.

Table 6 summarizes the projected levels of service for the end of Phase 1.

Table 6: Projected Traffic Conditions (2013, End of Phase 1)

Intersection	AM Peak			PM Peak		
	Maximum approach delay (s)	Max. Volume to Capacity Ratio	LoS (based on maximum delay)	Maximum approach delay	Max. Volume to Capacity Ratio	LoS (based on maximum delay)
Highway 99 / Pemberton Farm Road	9.7	0.09	A	11.3	0.19	B

As shown in ***Table 6***, the addition of background traffic growth and site traffic would have a very slight impact on traffic operations at the intersection. Maximum approach delay would increase by only 0.4 seconds/vehicle in the AM peak and 0.6 seconds/vehicle in the PM peak compared to existing conditions. No physical modifications would be required at the intersection.

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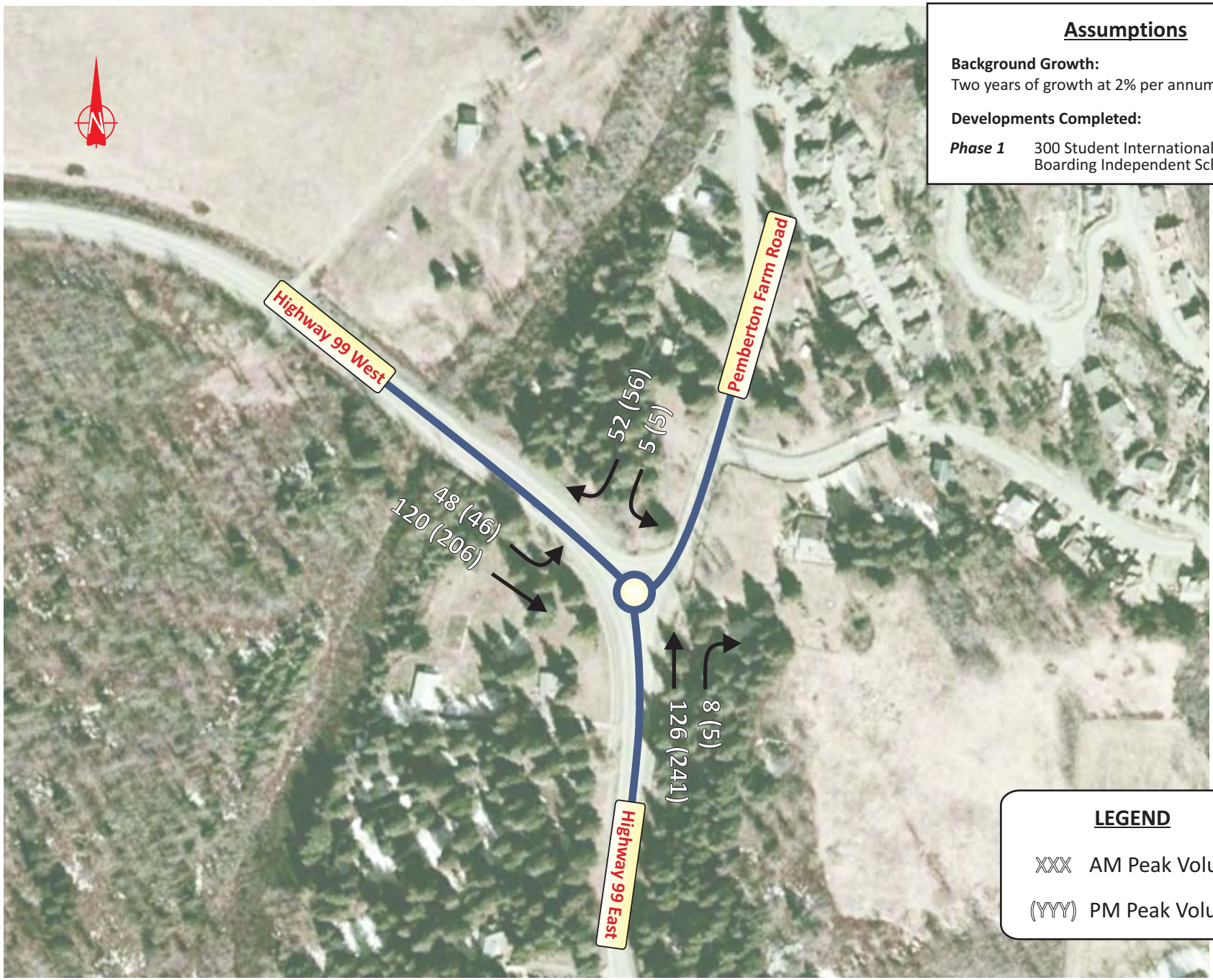
Phase 1 (2013): Site Generated Traffic Volumes

Figure 3



Assumptions

Background Growth:
Two years of growth at 2% per annum

Developments Completed:

Phase 1 300 Student International Day and Boarding Independent School

LEGEND

XXX AM Peak Volume

(YYY) PM Peak Volume

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Phase 1 (2013): Total Projected Traffic Volumes

Figure 4

5.2 Phase 2: Site Plus Background Growth to 2020

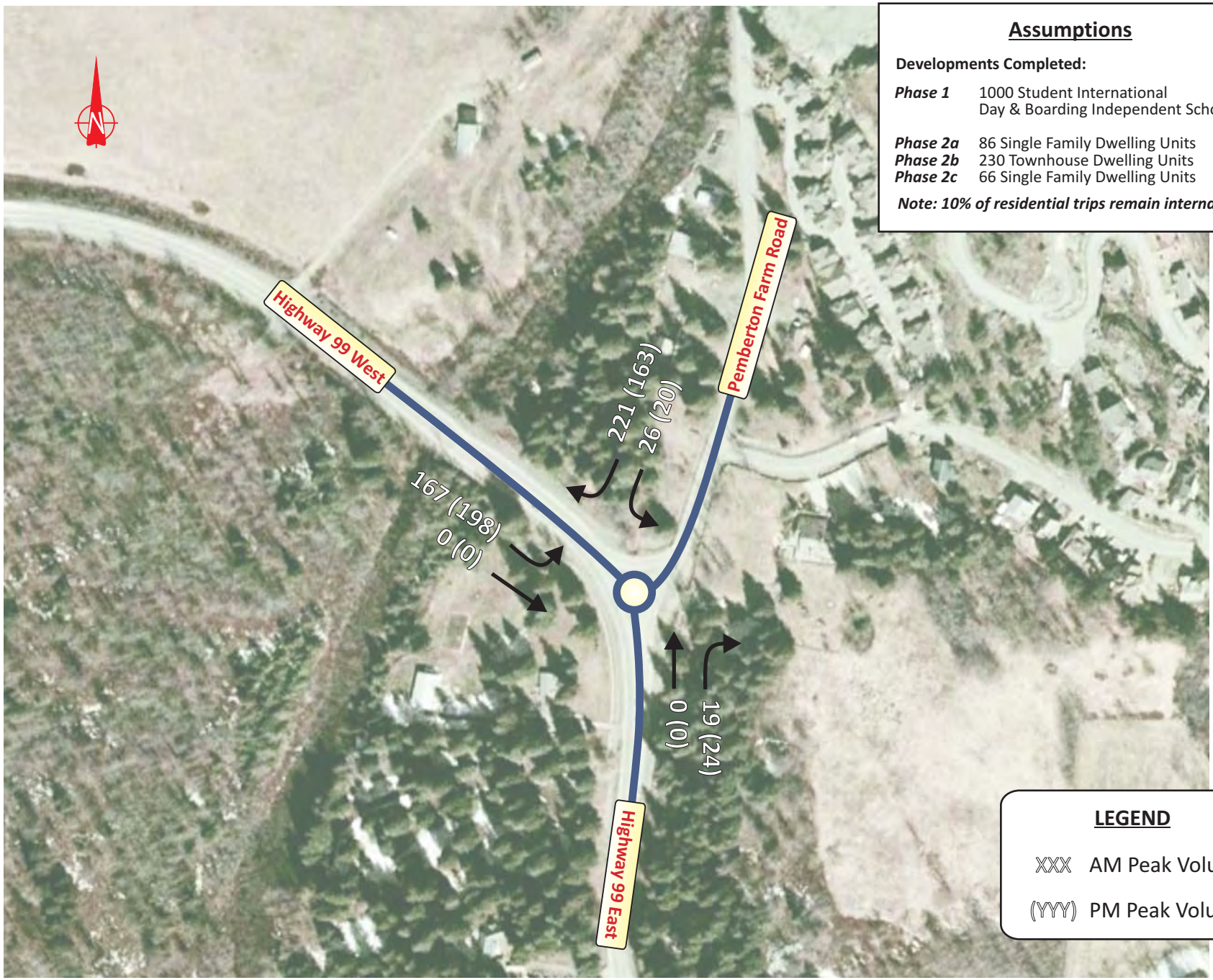
For Phase 2 (Phases 2a through 2c), existing traffic volumes were adjusted to account for nine years of background traffic growth (at 2% per annum for a growth factor of 1.19) before superimposing traffic generated by the International Day and Boarding School (increased enrollment to 1,000 students), 152 single family dwelling units and 230 townhouse dwelling units. Site-generated traffic volumes for the end of Phase 2 are graphically illustrated in ***Figure 5*** and total projected traffic volumes are shown in ***Figure 6***.

Table 7 summarizes the projected levels of service for the end of Phase 2.

Table 7: Projected Traffic Conditions (2020, End of Phase 2)

Intersection	AM Peak			PM Peak		
	Maximum approach delay (s)	Max. Volume to Capacity Ratio	LoS (based on maximum delay)	Maximum approach delay	Max. Volume to Capacity Ratio	LoS (based on maximum delay)
Highway 99 / Pemberton Farm Road	13.1	0.34	B	19.6	0.47	C

As shown in ***Table 7***, the addition of background traffic growth and site traffic would have moderate impacts on traffic operations. Although overall intersection LoS remains at A, maximum approach delays increase by 3.1 seconds/vehicle and 6.9 seconds/vehicle in the AM and PM peaks, respectively, compared to existing conditions. As shown in ***Appendix D***, the SBL and SBR movements from Pemberton Farm Road have LoS's of B and C in the AM and PM peaks respectively. The LoS for these movements suggest the intersection is still capable of handling the new assigned traffic in conjunction with background growth, and as such, no modifications would be required to the existing configuration.



Assumptions

Developments Completed:

Phase 1	1000 Student International Day & Boarding Independent School
Phase 2a	86 Single Family Dwelling Units
Phase 2b	230 Townhouse Dwelling Units
Phase 2c	66 Single Family Dwelling Units

Note: 10% of residential trips remain internal to the site

LEGEND

XXX AM Peak Volume

(YYY) PM Peak Volume

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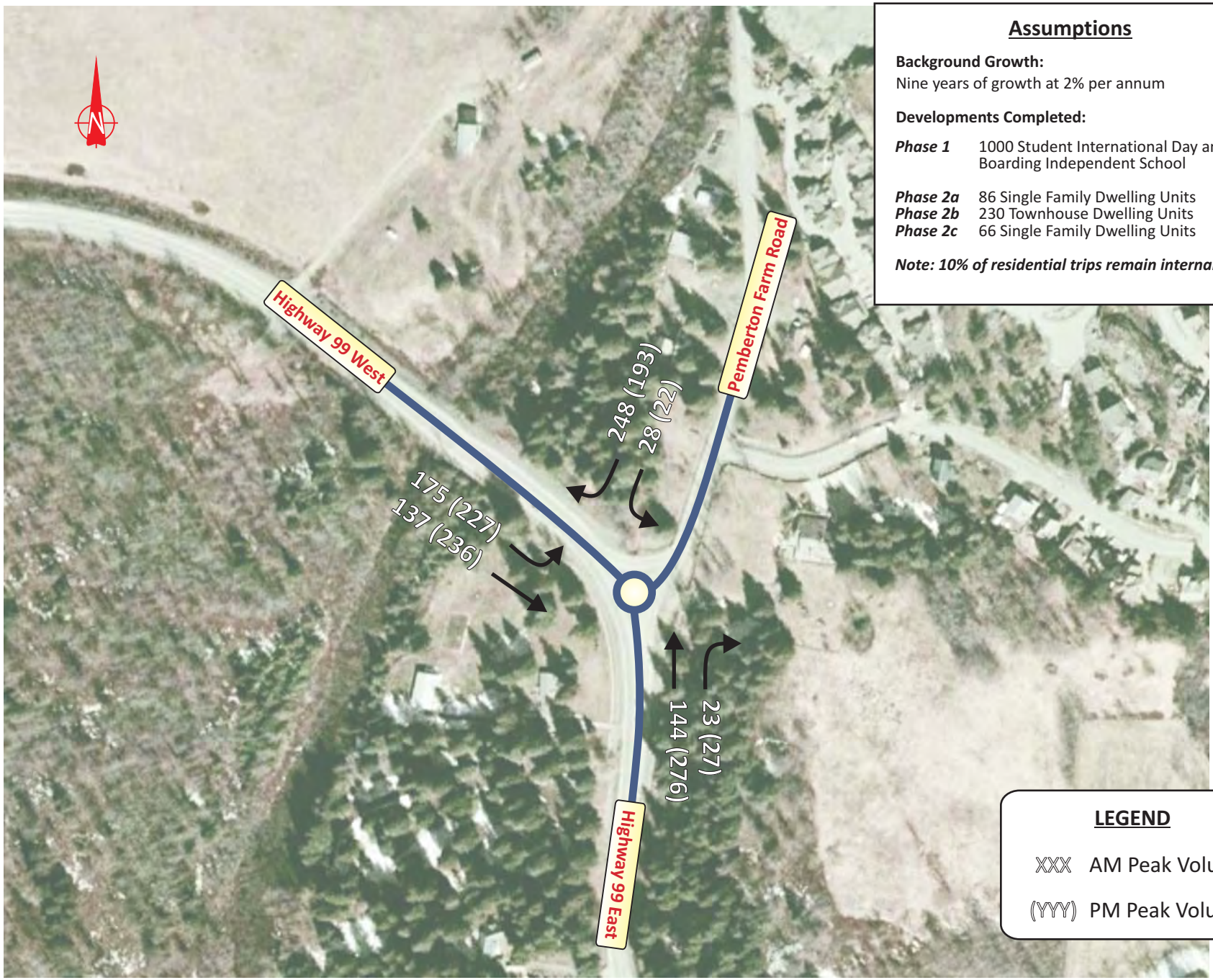
End of Phase 2a - 2c (2020): Site Generated Traffic Volumes

Figure 5



Assumptions

Background Growth:
Nine years of growth at 2% per annum

Developments Completed:

Phase 1	1000 Student International Day and Boarding Independent School
Phase 2a	86 Single Family Dwelling Units
Phase 2b	230 Townhouse Dwelling Units
Phase 2c	66 Single Family Dwelling Units

Note: 10% of residential trips remain internal to the site

LEGEND

XXX AM Peak Volume

(YYY) PM Peak Volume

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End of Phase 2a - 2c (2020): Total Projected Traffic Volumes

Figure 6

5.3 Phases 3 - 5: Site Plus Background Traffic 2030

For Phases 3 through 5, existing traffic volumes were adjusted to account for nineteen years of background traffic growth (at 2% per annum for a growth factor of 1.46) before superimposing traffic generated by the International Day and Boarding Independent School (increased enrollment to 1,000 students), 152 single family dwelling units and 230 townhouse dwelling units from the Ravens Crest Development, the Sabre / Biro 120 unit residential subdivision, the Pemberton Community Sports Complex and the 1,226 single family units from the Lil'wat Transfer Lands. Site-generated traffic volumes for the end of Phases 3 to 5 are graphically illustrated in ***Figure 7*** and total projected traffic volumes are shown in ***Figure 8***.

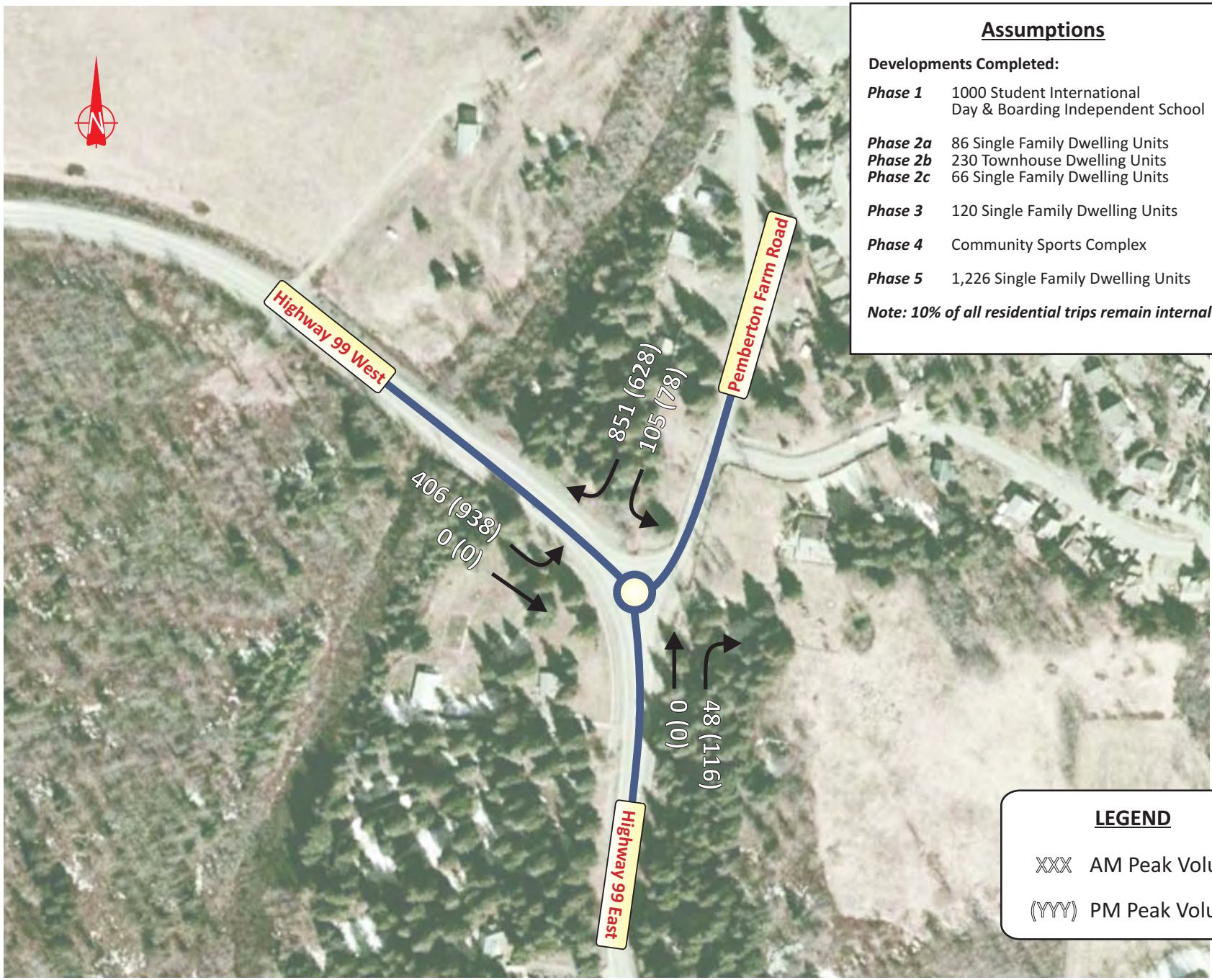
Table 8 summarizes the projected levels of service for the end of Phases 3-5. Mitigated conditions are shown in square brackets.

Table 8: Projected Traffic Conditions (2030, End of Phase 3)

Intersection	AM Peak			PM Peak		
	Maximum approach delay (s)	Max. Volume to Capacity Ratio	LoS (based on delay)	Maximum approach delay	Max. Volume to Capacity Ratio	LoS (based on delay)
Highway 99 / Pemberton Farm Road	>180 [7.8]	1.38 [0.61]	F [A]	>180 [16.0]	>2.0 [0.82]	F [B]

As shown in ***Table 8***, the addition of background traffic growth and site traffic would cause the intersection to fail under existing conditions. In particular, the SB movements from Pemberton Farm Road would experience extremely high delays. Thus, mitigation is required in the form of signalization, provision of double eastbound to northbound left-turn lanes and a southbound to westbound right-turn lane. The results of mitigation are shown in the square brackets in ***Table 8.***

As an alternative mitigation measure, an alternative road connection could be explored between the site and Highway 99 or downtown Pemberton. Depending on the quality of the connection, it could relieve the impacts to the Highway 99 / Pemberton Farm Road intersection and possibly reduce the mitigation requirements.



Assumptions

Developments Completed:

Phase 1	1000 Student International Day & Boarding Independent School
Phase 2a	86 Single Family Dwelling Units
Phase 2b	230 Townhouse Dwelling Units
Phase 2c	66 Single Family Dwelling Units
Phase 3	120 Single Family Dwelling Units
Phase 4	Community Sports Complex
Phase 5	1,226 Single Family Dwelling Units

Note: 10% of all residential trips remain internal to the site

LEGEND

XXX AM Peak Volume

(YYY) PM Peak Volume

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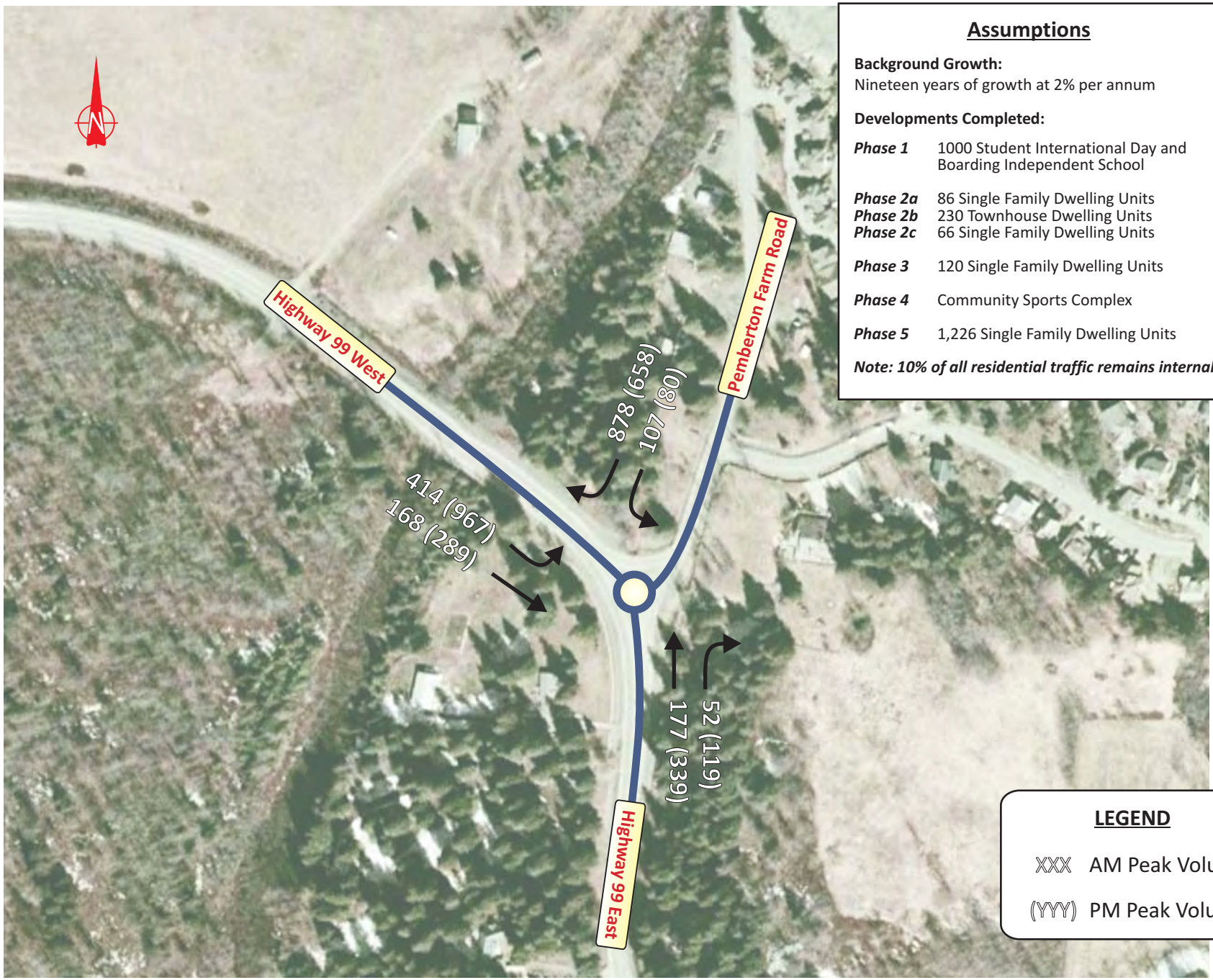
End of Phase 3 - 5 (2030): Site Generated Traffic Volumes

Figure 7



Assumptions

Background Growth:
Nineteen years of growth at 2% per annum

Developments Completed:

Phase 1	1000 Student International Day and Boarding Independent School
Phase 2a	86 Single Family Dwelling Units
Phase 2b	230 Townhouse Dwelling Units
Phase 2c	66 Single Family Dwelling Units
Phase 3	120 Single Family Dwelling Units
Phase 4	Community Sports Complex
Phase 5	1,226 Single Family Dwelling Units

Note: 10% of all residential traffic remains internal to the site

LEGEND

XXX AM Peak Volume

(YYY) PM Peak Volume

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End of Phase 3 - 5 (2030): Total Projected Traffic Volumes

Figure 8

ROAD-RAIL CROSSING ANALYSIS

For Phase 1, no traffic will be crossing the CN at-grade crossing located to the north as there is no outlet to connecting highways. For future phases, however, additional traffic will be using the crossing and this may increase daily road-rail cross products to a level requiring a crossing upgrade. Note that only the new residential traffic (discounted by 10% to reflect work at home) is assumed to cross the CN railway as both the Boarding School and the Recreational Centre will have an access located south of the crossing.

It is assumed that CN currently runs 4 trains a day on average through the Pemberton Farm Road crossing. This is based on information obtained in 2008, however, this number may increase or decrease based on CN's business plans.

Table 9 summarizes forecast cross-products on the Pemberton Farm Road / CN Rail crossing. Daily volumes on Pemberton Farm Road have been estimated using a peak hour to daily factor of 10 and are multiplied by four (trains per day) to obtain the estimated cross product.

Table 9: Road-Rail Cross Products

Phase	Pemberton Farm Road at CN Rail Cross Product (daily vehicles x daily trains)
1 (2013)	n/a – generated traffic remains south of the rail crossing
2 (2020)	2,220 vpd x 4 tpd = 8,880
3-5 (2030)	16,020 vph x 4 tpd = 64,080

As shown in ***Table 9***, cross products of road and rail volumes are expected to increase as a result of development. Currently, rail crossings are STOP-controlled only. Transport Canada thresholds for upgraded signalization are based on cross products with a cross product of over 1,000 or more warranting bells and signals, and over 50,000 warranting gate controls. If the cross product forecasts are realized, this would require bells and signals by the end of 2020 and gates by the end of 2030.

6.0 MITIGATION MEASURES

Based on the foregoing analysis, a number of road modifications have been recommended. They have been summarized by scenario in ***Table 10***.

Table 10: Mitigation Matrix

Development	Implementation Timeframe		
	Opening Day (2013)	Short Term (2020)	Long Term (2030)
Baseline	n/a	n/a	n/a
Total development (including background traffic growth)	n/a	n/a	• Provide signalized control at intersection of Highway 99 and Pemberton Farm Road • Provide dual left turn lanes with 150m storage lengths, on Highway 99 Eastbound • Provide two NB lanes on Pemberton Farm Road for approximately 150 m • Provide 35m storage bay for SB Left turn from Pemberton Farm Road • Provide 60 m acceleration lane from Pemberton Farm Road southbound to Highway 99 westbound

Based on the 2030 build-out turning movement volumes, the required storage lengths were calculated for key intersections using the 95th percentile queue as reported by Synchro or 1.5 times the average number of vehicles to be stored per cycle for signalized intersections (whichever is higher). The acceleration distance was calculated from TAC Table 2.3.10.1.

ROAD CROSS SECTION IMPLICATIONS

Forecast laning requirements are based on directional link volumes. With a peak directional volume of 1,070 vph immediately north of Highway 99, by 2030 the developed section of Pemberton Farm Road should be upgraded to major collector standards to accommodate link flows.

7.0 SITE ACCESS AND CIRCULATION

Although the proposed site plans have not been developed in detail, based on the preliminary layout of the Phase 1 Independent School and the Community Recreation Centre shown in Appendix E, the following are some general comments:

- The main access to/from the Independent School is spaced approximately 100 m from the CN rail line which and is in a clear line of sight which will allow for minimal impacts to the rail line. Future accesses to/from additional development phases should be located at a very minimum 30 m from the rail line or where traffic analysis indicates queuing will not be an issue.
- The access point to/from the Community Sports Complex should be designed to protect adequate sight triangles given that it lies on the inside of a curve.
- As the residential community builds out, the selection of an appropriate roadway cross-section and neighborhood layout should take into consideration design elements to facilitate pedestrian and cyclist connectivity, control vehicle speeds and allow for a safe, but context-sensitive roadway footprint.
- The size of the potential new residential community may warrant transit service in the future and roadway cross sections and turning radii should accommodate these vehicles and their stops at key junctions.

8.0 PEDESTRIAN AND BICYCLE NETWORK

With the implementation of roadway improvements to service planned development there is an opportunity to enhance safety and convenience for these modes of travel. With the potential upgrade of Pemberton Farm Road to a major collector standard, it is recommended that wider shoulder lanes be provided to facilitate on-road cycling. Sidewalks should be provided on a minimum of one side of the road to allow walking connectivity with the proposed school and recreational sites. For long term community development, it is suggested than an alternative multi-use pathway connection between the site and downtown be explored. One alternative corridor would be alongside the CN rail crossing of the Lillooet River (a possible extension of the Friendship Trail).

9.0 FINDINGS AND RECOMMENDATIONS

Based on the foregoing analysis, the following findings and recommendations are provided:

1. Over the next 19 years, a multi-phase mix of development may be completed along Pemberton Farm Road. These consist of a 1,000 student International Day & Boarding Independent School, up to 1,698 residential dwelling units and a 40,000 ft2 Community Sports Complex including 3 soccer / sports fields.
2. The Pemberton Farm Road / Highway 99 intersection is the sole proposed access point for all subject developments. Based on July 2011 traffic counts, this stop-controlled intersection currently operates at a very good level of service.
3. The Squamish Lillooet Regional District is forecast to grow at just under 2.0% per annum over the next 19 years. Background traffic growth along Highway 99 is assumed to increase proportionally.
4. Using the most analogous ITE trip generation rates and appropriate discount factors, by 2013 the International Day & Boarding Independent School Site will generate up to 72 vph in the AM peak hour. By 2020, the addition of 382 residential dwelling units will add an additional 273 vph, along with an additional 168 vph generated by increased enrollment at the Indepedent School. By 2030, an additional 1,346 dwelling units will increase traffic by 1,358 vph and a new Community Sports Complex will increase traffic by 128 vph. Note that 10% of all residential trips are assumed to remain internal to the site (i.e. work at home) as per prevailing trends.
5. For the 2013 horizon year, minimal impacts to levels of service at Pemberton Farm Road / Highway 99 are expected and no mitigation measures are required as a result of development traffic.
6. For the 2020 horizon year, moderate impacts to levels of service at Pemberton Farm Road / Highway 99 are expected and no mitigation measures are required as a result of development traffic.
7. For the 2030 horizon year, significant deterioration in levels of service at Pemberton Farm Road / Highway 99 are expected to trigger the following mitigation measures:
    - Provide signalized control at intersection of Highway 99 and Pemberton Farm Road
    - Provide dual left turn lanes with 150m storage lengths, on Highway 99 Eastbound
    - Provide two NB lanes on Pemberton Farm Road for approximately 150 m

- Provide 35m storage bay for SB Left turn from Pemberton Farm Road
- Provide 60 m acceleration lane from Pemberton Farm Road southbound to Highway 99 westbound

8. Based on the estimated current number of daily train crossings of Pemberton Farm Road, an upgrade of the crossing control to bells and flashers by 2020 and to gates by 2030 is potentially required according to Transport Canada standards.
9. Both the upgrades to the Pemberton Farm Road / Highway 99 intersection and the Pemberton Farm Road / CN Rail crossing could be avoided or deferred through the provision of an alternative connection to either Highway 99 or downtown Pemberton.
10. By 2030, if assumed development levels are realized, Pemberton Farm Road should be upgraded to a major collector standard with wide shoulder lanes for on-road cycling and sidewalks in the vicinity of the school and recreational sites.
11. As the preliminary concept plans are refined in more detail, consider locating future accesses at a very minimum 30 m from the rail line or where traffic analysis indicates queuing will not be an issue. The access point to/from the Community Recreation Centre should be designed to protect adequate sight triangles given that it lies on the inside of a curve. The selection of an appropriate roadway cross-section and neighborhood layout should take into consideration design elements to facilitate pedestrian and cyclist connectivity, control vehicle speeds and allow for a safe, but context-sensitive roadway footprint.

APPENDIX A

Existing Traffic Counts

TRAFFIC COUNT

N/S Street Pemberton Farm Road
E/W Street Highway 99
Date: July 1, 2020
Day: Wednesday
Weather: Wet, Not Raining, Cloudy, Full Cover

GP

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
7:30 AM	0	7	3	14	15	0
7:45 AM	0	9	1	17	31	0
8:00 AM	2	3	2	21	30	1
8:15 AM	1	5	2	25	22	0
8:30 AM	0	8	3	15	29	1
8:45 AM	0	8	0	26	33	1
9:00 AM	1	5	3	37	26	1
9:15 AM	1	7	2	20	24	0
9:30 AM	0	5	4	22	25	0

Heavy Vehicles

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
7:30 AM	0	0	0	0	1	0
7:45 AM	0	0	0	0	2	0
8:00 AM	0	0	0	2	3	0
8:15 AM	0	0	0	4	0	0
8:30 AM	0	0	0	2	4	1
8:45 AM	0	0	0	4	3	0
9:00 AM	0	1	0	2	4	0
9:15 AM	0	1	0	3	0	0
9:30 AM	0	0	0	0	1	0

TOTAL

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
7:30 AM	0	7	3	14	16	0
7:45 AM	0	9	1	17	33	0
8:00 AM	2	3	2	23	33	1
8:15 AM	1	5	2	29	22	0
8:30 AM	0	8	3	17	33	2
8:45 AM	0	8	0	30	36	1
9:00 AM	1	6	3	39	30	1
9:15 AM	1	8	2	23	24	0
9:30 AM	0	5	4	22	26	0

TRAFFIC COUNT

N/S Street Pemberton Farm Road
E/W Street Highway 99
Date: July 1, 2019
Day: Tuesday
Weather: Sunny with clouds

GP

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
3:00 PM	1	7	7	32	40	1
3:15 PM	4	1	1	24	31	2
3:30 PM	1	2	7	31	34	0
3:45 PM	1	3	4	32	29	2
4:00 PM	2	3	7	47	49	0
4:15 PM	1	8	8	44	67	1
4:30 PM	0	11	4	52	39	2
4:45 PM	0	5	6	43	46	0
5:00 PM	1	4	10	50	53	0
5:15 PM	0	2	8	41	52	0
5:30 PM	0	7	17	29	34	1
5:45 PM	1	1	7	45	31	1

Heavy Vehicles

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
3:00 PM	0	0	0	4	4	0
3:15 PM	1	0	0	2	5	1
3:30 PM	0	0	0	3	5	0
3:45 PM	0	0	1	2	9	1
4:00 PM	0	1	1	8	5	0
4:15 PM	0	1	0	1	12	0
4:30 PM	0	1	0	3	4	0
4:45 PM	0	0	0	3	6	0
5:00 PM	0	0	1	2	5	0
5:15 PM	0	0	0	1	3	1
5:30 PM	0	0	0	2	5	0
5:45 PM	0	1	1	2	6	0

TOTAL

Time Starting	SBL	SBR	EBL	EBT	WBT	WBR
3:00 PM	1	7	7	36	44	1
3:15 PM	5	1	1	26	36	3
3:30 PM	1	2	7	34	39	0
3:45 PM	1	3	5	34	38	3
4:00 PM	2	4	8	55	54	0
4:15 PM	1	9	8	45	79	1
4:30 PM	0	12	4	55	43	2
4:45 PM	0	5	6	46	52	0
5:00 PM	1	4	11	52	58	0
5:15 PM	0	2	8	42	55	1
5:30 PM	0	7	17	31	39	1
5:45 PM	1	2	8	47	37	1

APPENDIX B

Existing Conditions Capacity Analysis

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	2	27	121	4	8	115
Peak Hour Factor	0.50	0.84	0.84	0.50	0.67	0.74
Hourly flow rate (vph)	4	32	144	8	12	155
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	323	144			144	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	323	144			144	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	96			99	
cM capacity (veh/h)	669	898			1451	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	36	144	8	12	155
Volume Left	4	0	0	12	0
Volume Right	32	0	8	0	0
cSH	1010	1700	1700	1451	1700
Volume to Capacity	0.04	0.08	0.00	0.01	0.09
Queue Length 95th (m)	0.9	0.0	0.0	0.2	0.0
Control Delay (s)	9.3	0.0	0.0	7.5	0.0
Lane LOS	A			A	
Approach Delay (s)	9.3	0.0		0.5	
Approach LOS	A				

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	2	30	232	3	29	198
Peak Hour Factor	0.50	0.63	0.73	0.38	0.66	0.90
Hourly flow rate (vph)	4	48	318	8	44	220
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	626	318			318	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	626	318			318	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	99	93			96	
cM capacity (veh/h)	435	711			1237	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	52	318	8	44	220
Volume Left	4	0	0	44	0
Volume Right	48	0	8	0	0
cSH	771	1700	1700	1237	1700
Volume to Capacity	0.07	0.19	0.00	0.04	0.13
Queue Length 95th (m)	1.7	0.0	0.0	0.9	0.0
Control Delay (s)	10.7	0.0	0.0	8.0	0.0
Lane LOS	B			A	
Approach Delay (s)	10.7	0.0		1.3	
Approach LOS	B				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C

Trip Generation Rates

Private School (K-12)
(536)

Average Vehicle Trip Ends vs: Students
On a: Weekday,
A.M. Peak Hour

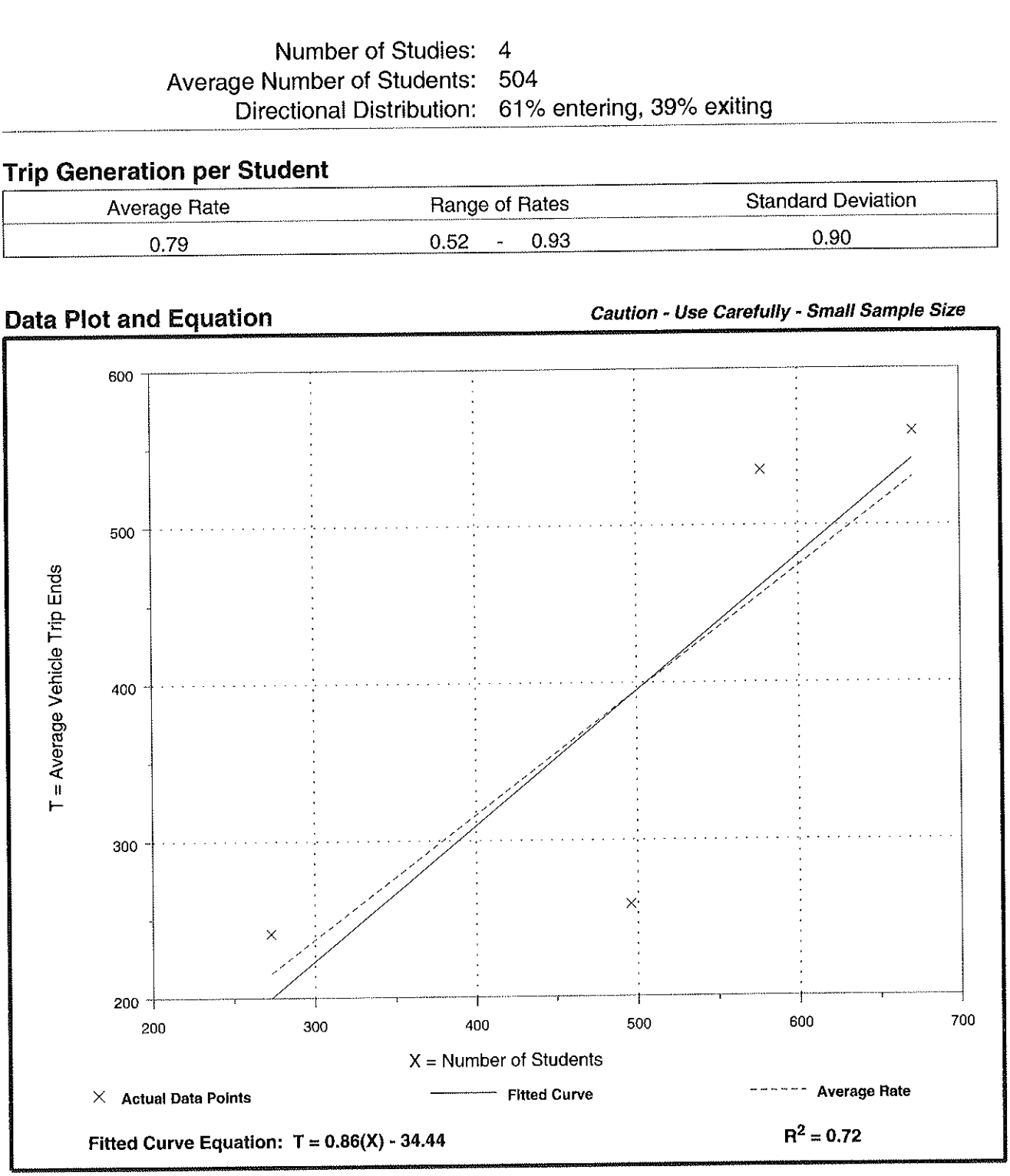
Number of Studies: 4
Average Number of Students: 504
Directional Distribution: 61% entering, 39% exiting

Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.79	0.52 - 0.93	0.90

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: T = 0.86(X) - 34.44

R^2 = 0.72

Private School (K-12)
(536)

Average Vehicle Trip Ends vs: Students
On a: Weekday,
P.M. Peak Hour of Generator

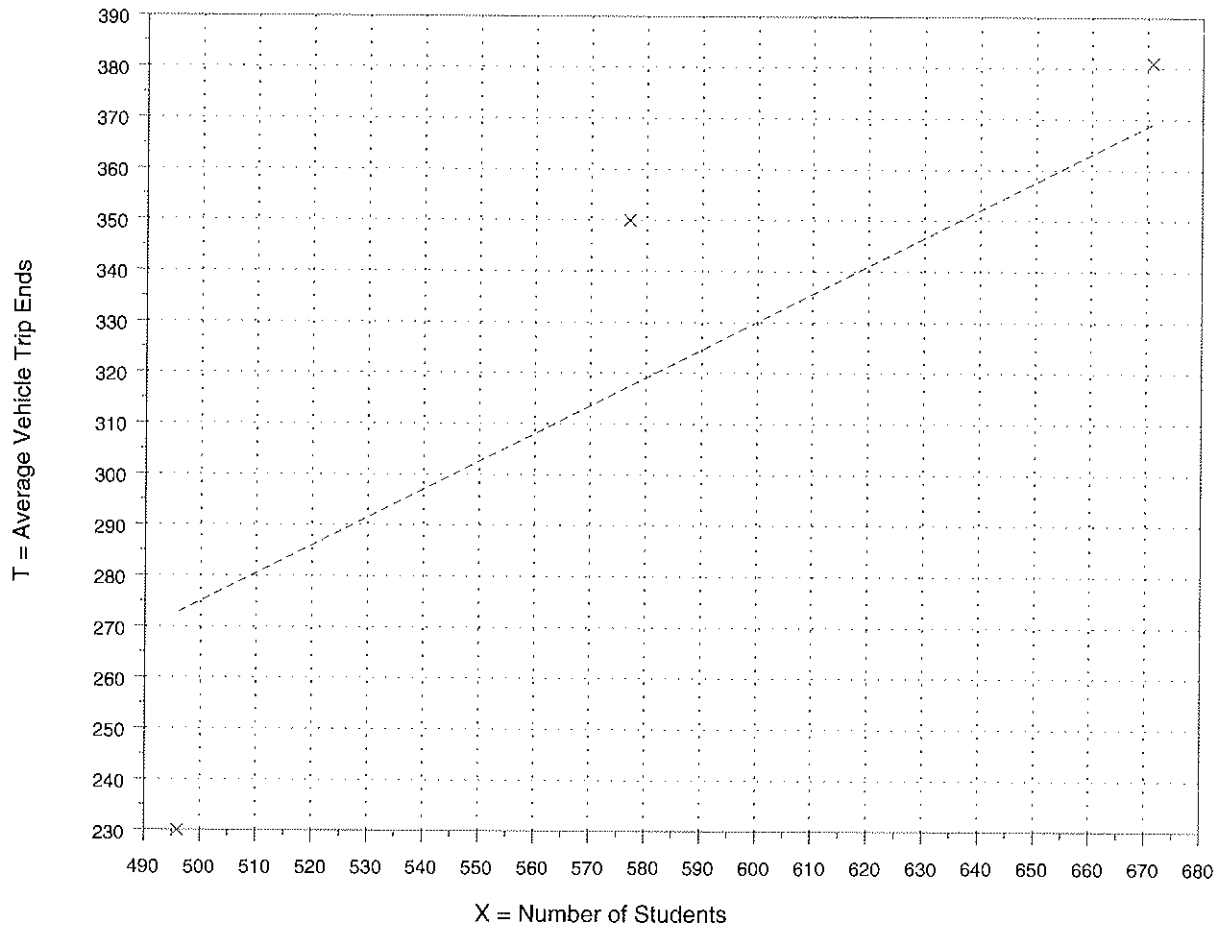
Number of Studies: 3
Average Number of Students: 581
Directional Distribution: 41% entering, 59% exiting

Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.55	0.46 - 0.61	0.74

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: Not given

R^2 = ****

Soccer Complex
(488)

Average Vehicle Trip Ends vs: **Fields**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

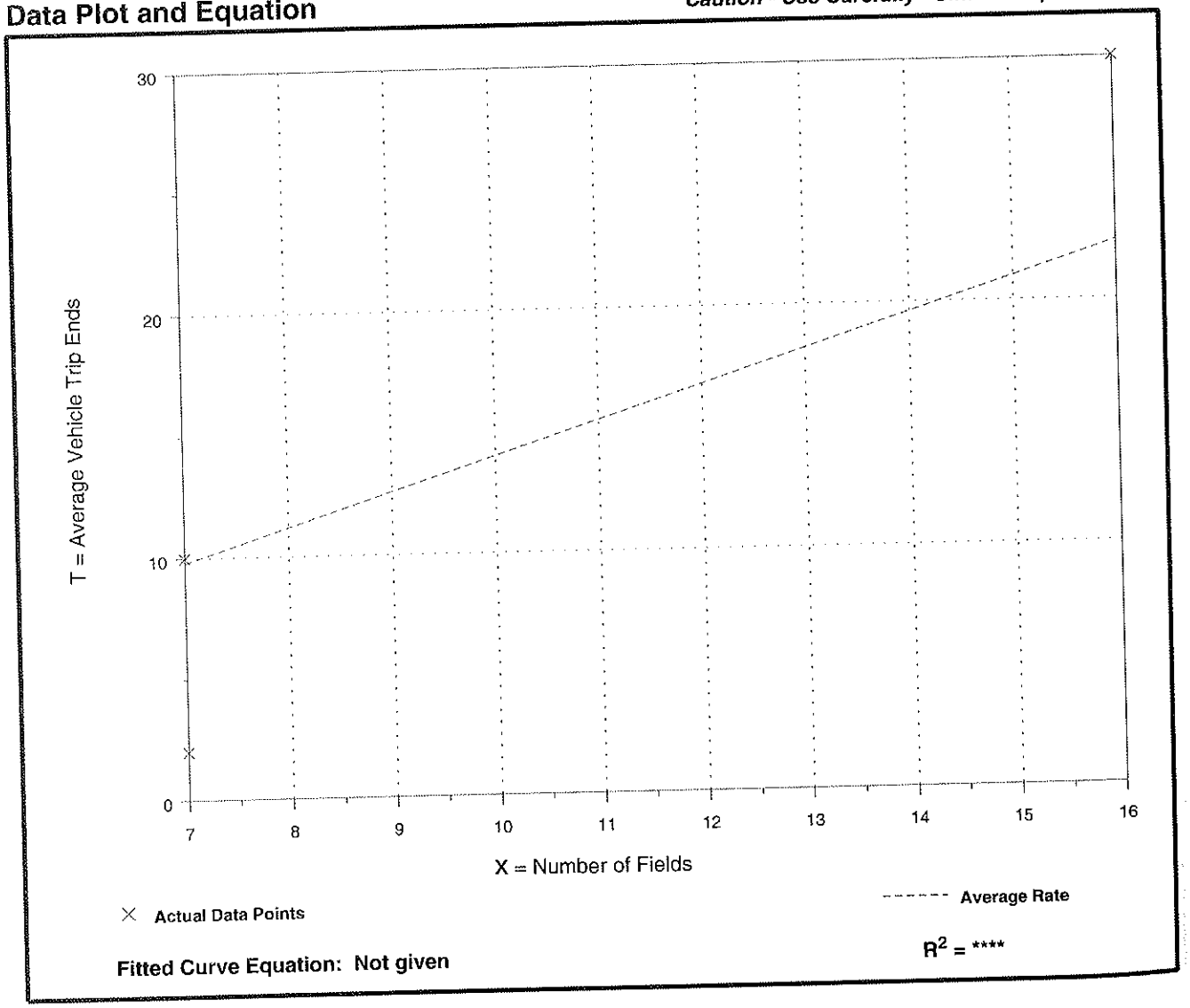
Number of Studies: 3
Average Number of Fields: 10
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Field

Average Rate	Range of Rates	Standard Deviation
1.40	0.29 - 1.88	1.32

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: Not given

R^2 = ****

Soccer Complex
(488)

Average Vehicle Trip Ends vs: **Fields**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

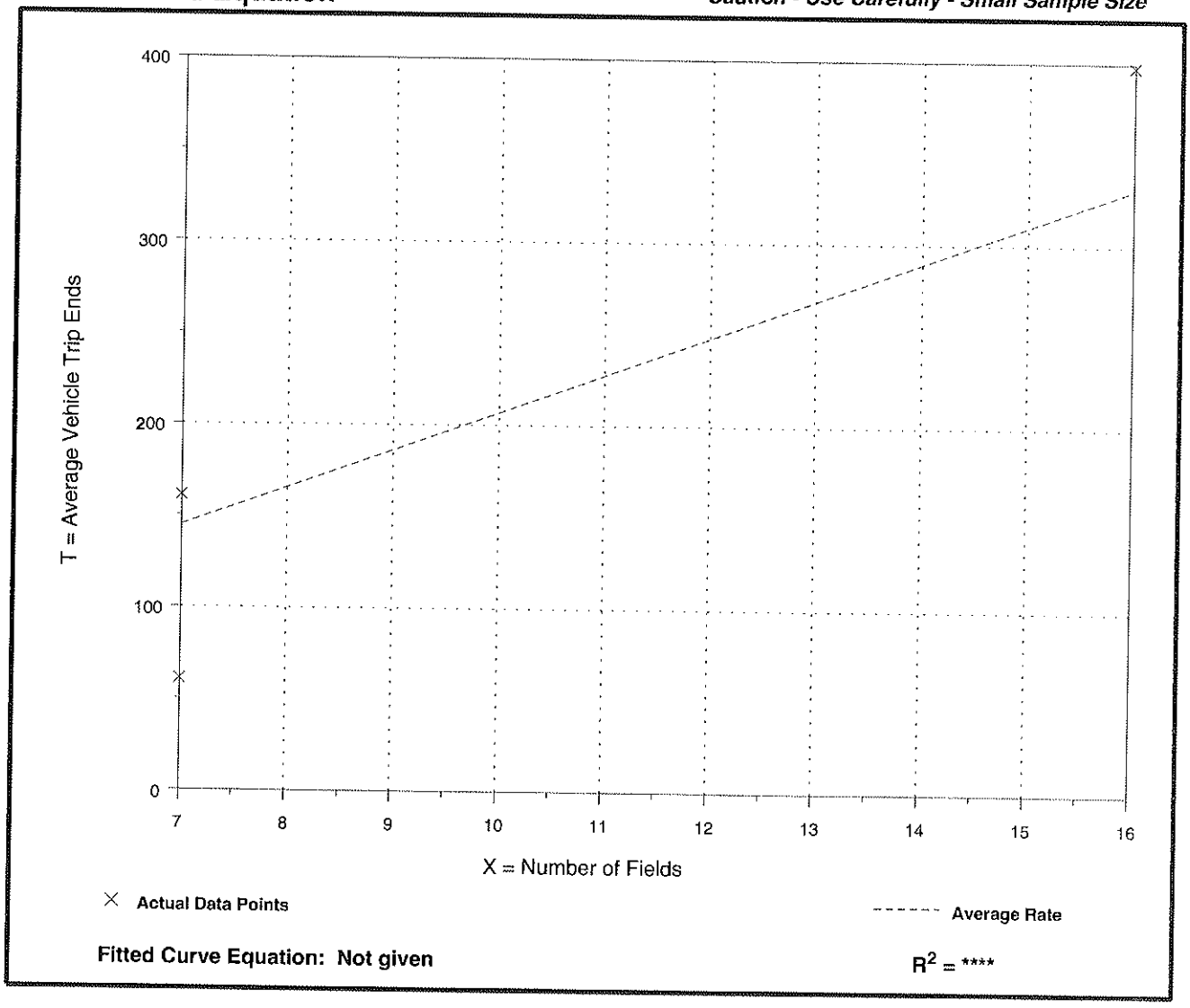
Number of Studies: 3
Average Number of Fields: 10
Directional Distribution: 69% entering, 31% exiting

Trip Generation per Field

Average Rate	Range of Rates	Standard Deviation
20.67	8.71 - 24.88	8.06

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: Not given

R^2 = ****

Recreational Community Center
(495)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

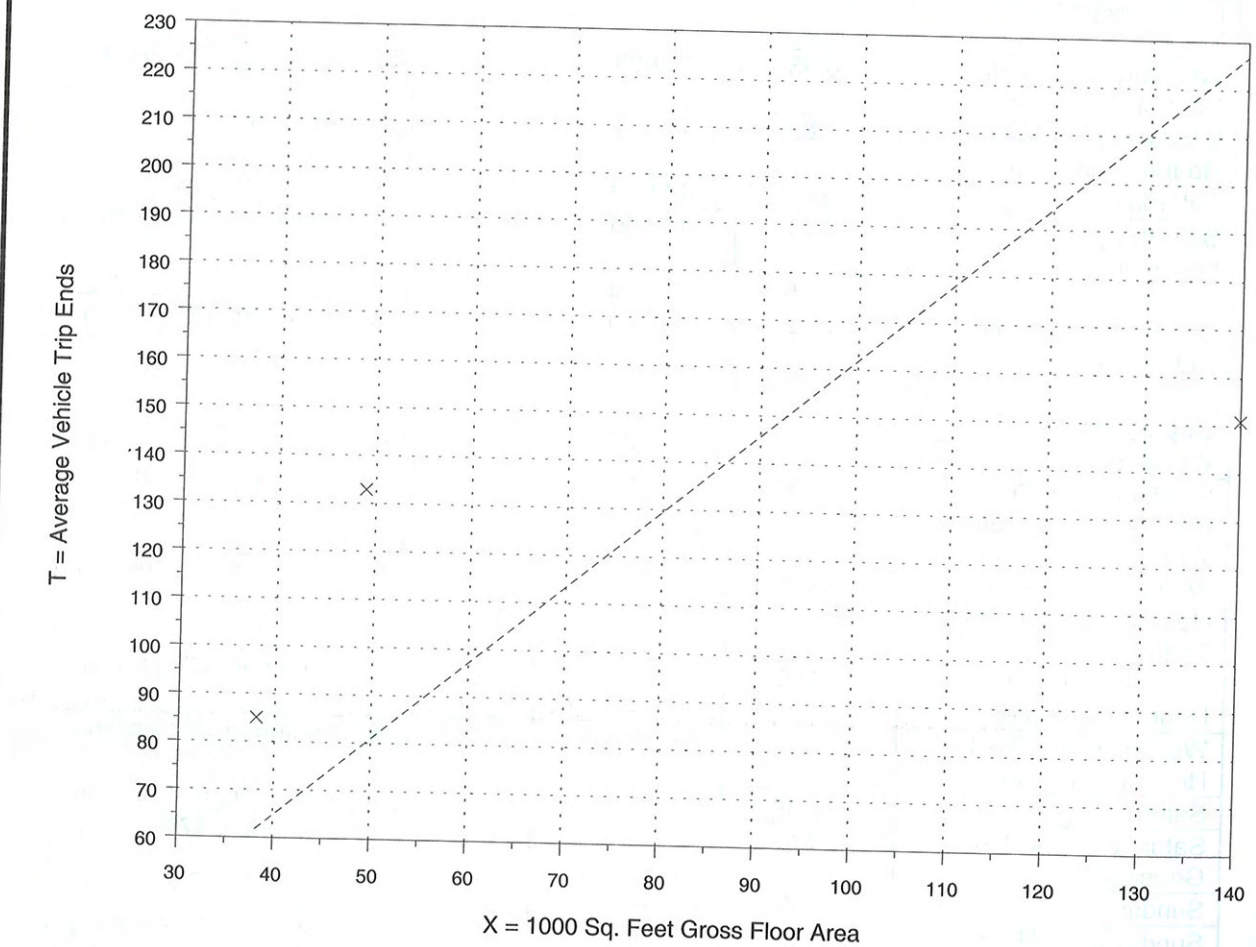
Number of Studies: 3
Average 1000 Sq. Feet GFA: 76
Directional Distribution: 61% entering, 39% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
1.62	1.08 - 2.71	1.45

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: Not given

R^2 = ****

Recreational Community Center
(495)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

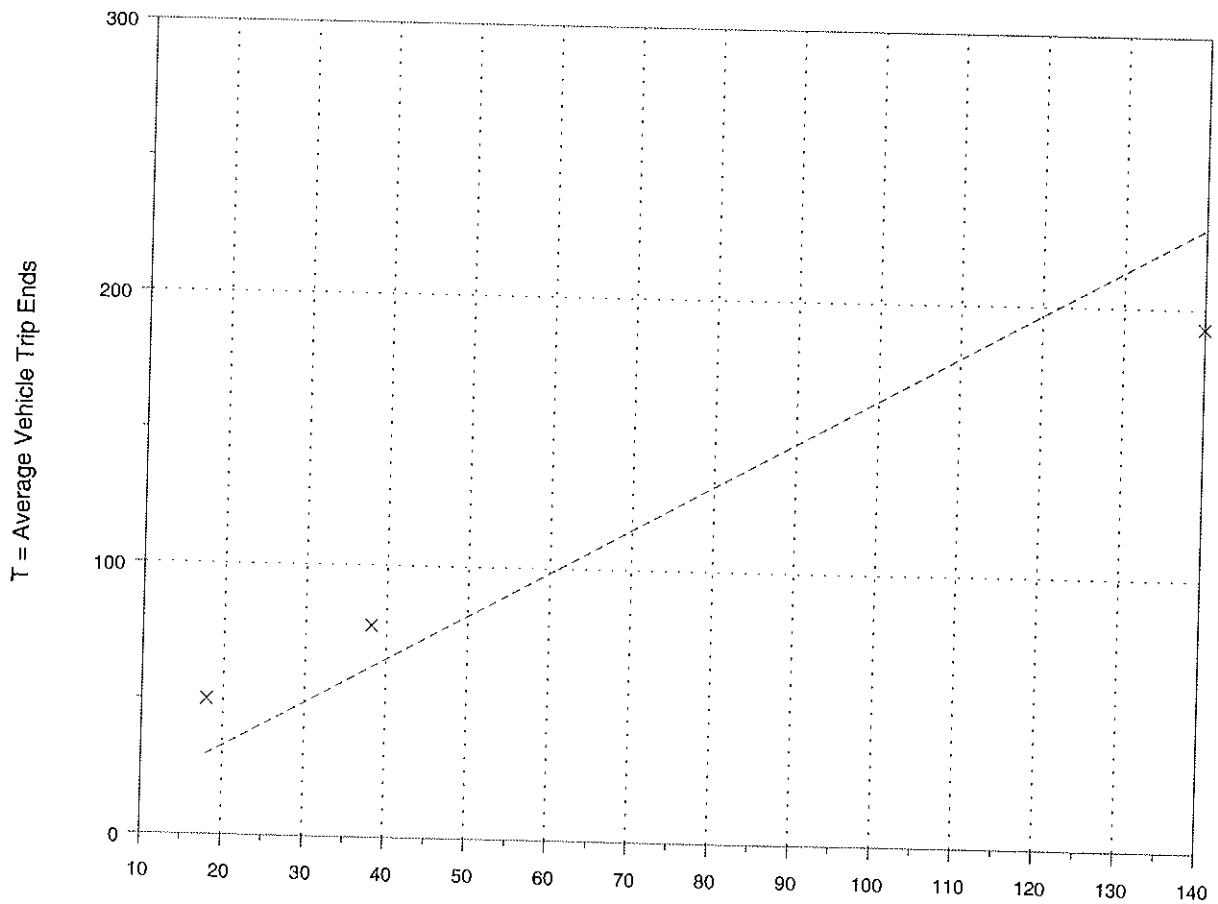
Number of Studies: 3
Average 1000 Sq. Feet GFA: 65
Directional Distribution: 29% entering, 71% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
1.64	1.38 - 2.78	1.35

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: Not given

R^2 = ****

Residential Condominium/Townhouse
(230)

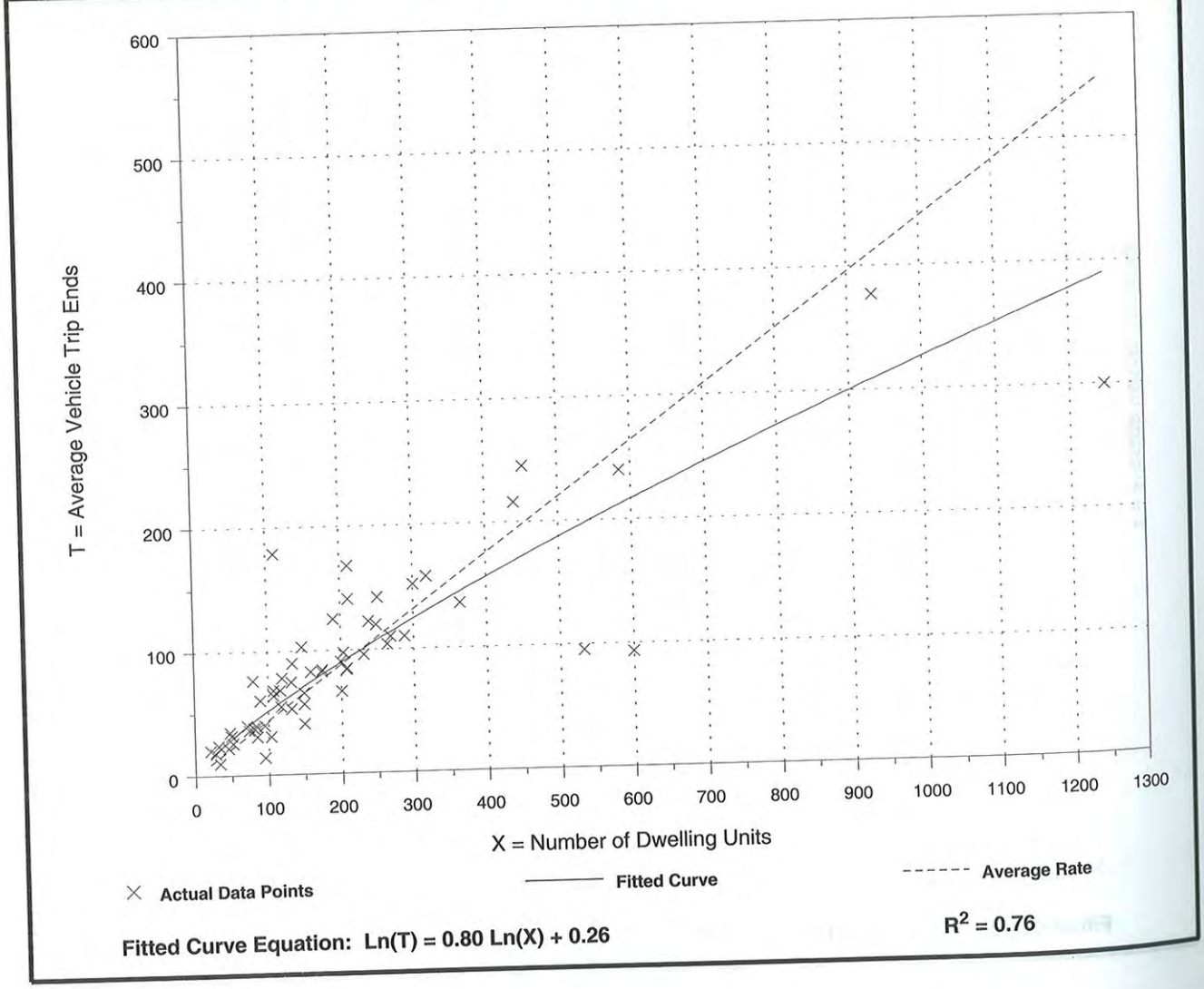
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 59
Avg. Number of Dwelling Units: 213
Directional Distribution: 17% entering, 83% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.61	0.69

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.80 Ln(X) + 0.26

R^2 = 0.76

Residential Condominium/Townhouse
(230)

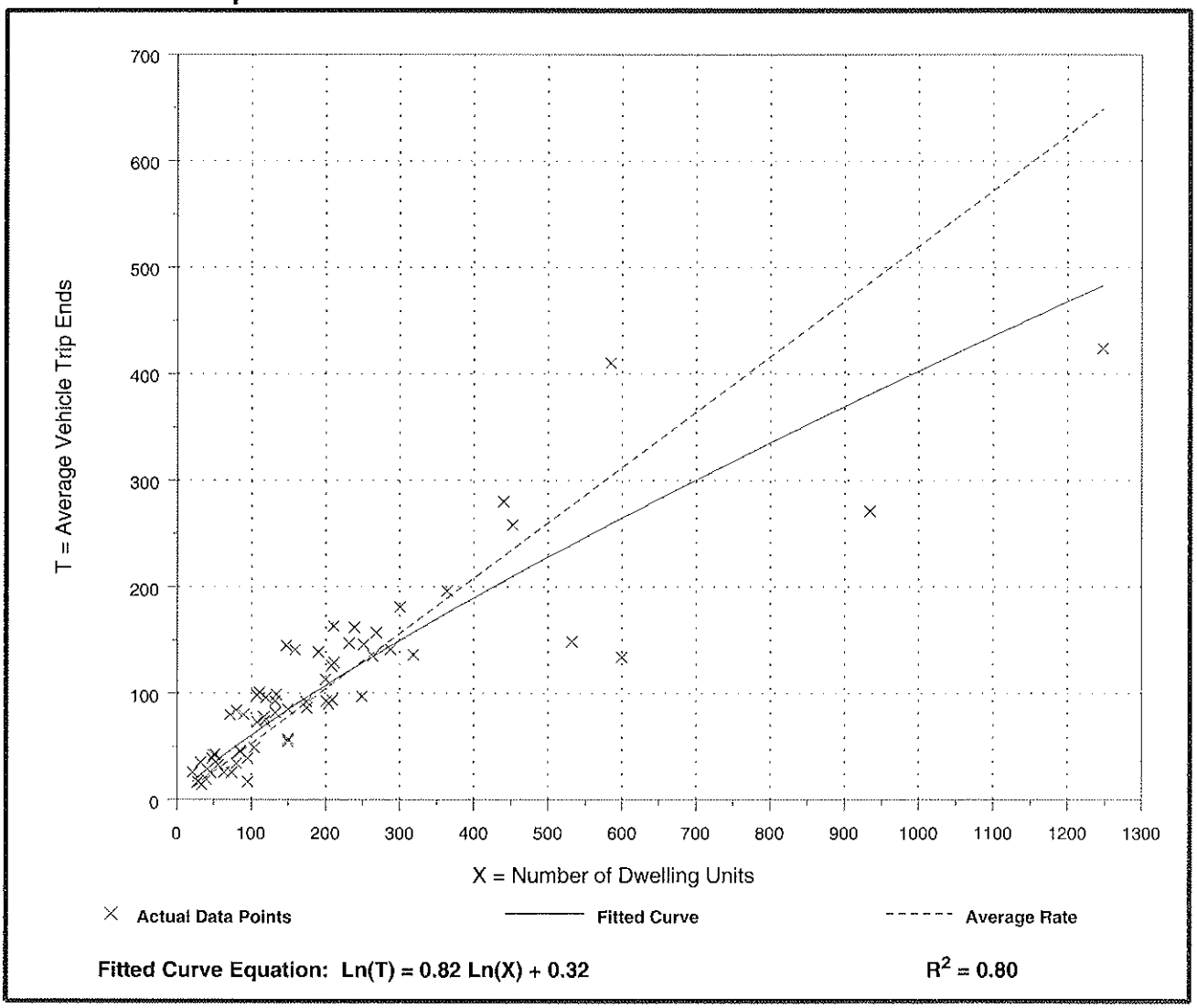
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 62
Avg. Number of Dwelling Units: 205
Directional Distribution: 67% entering, 33% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.82 Ln(X) + 0.32

R^2 = 0.80

Single-Family Detached Housing
(210)

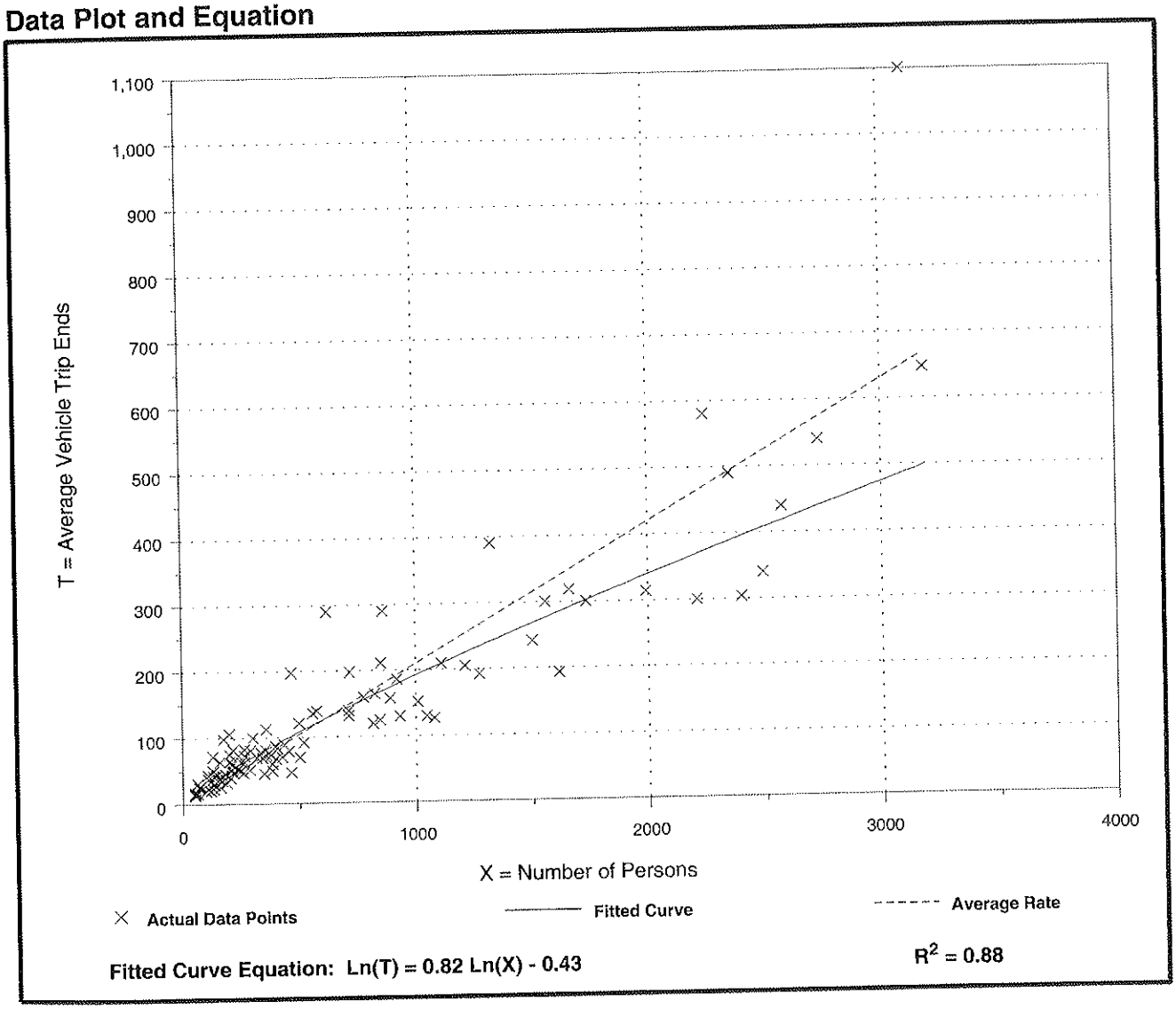
Average Vehicle Trip Ends vs: **Persons**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 111
Average Number of Persons: 632
Directional Distribution: 31% entering, 69% exiting

Trip Generation per Person

Average Rate	Range of Rates	Standard Deviation
0.21	0.10 - 0.56	0.46

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.82\ Ln(X) - 0.43$

$R^2 = 0.88$

Single-Family Detached Housing
(210)

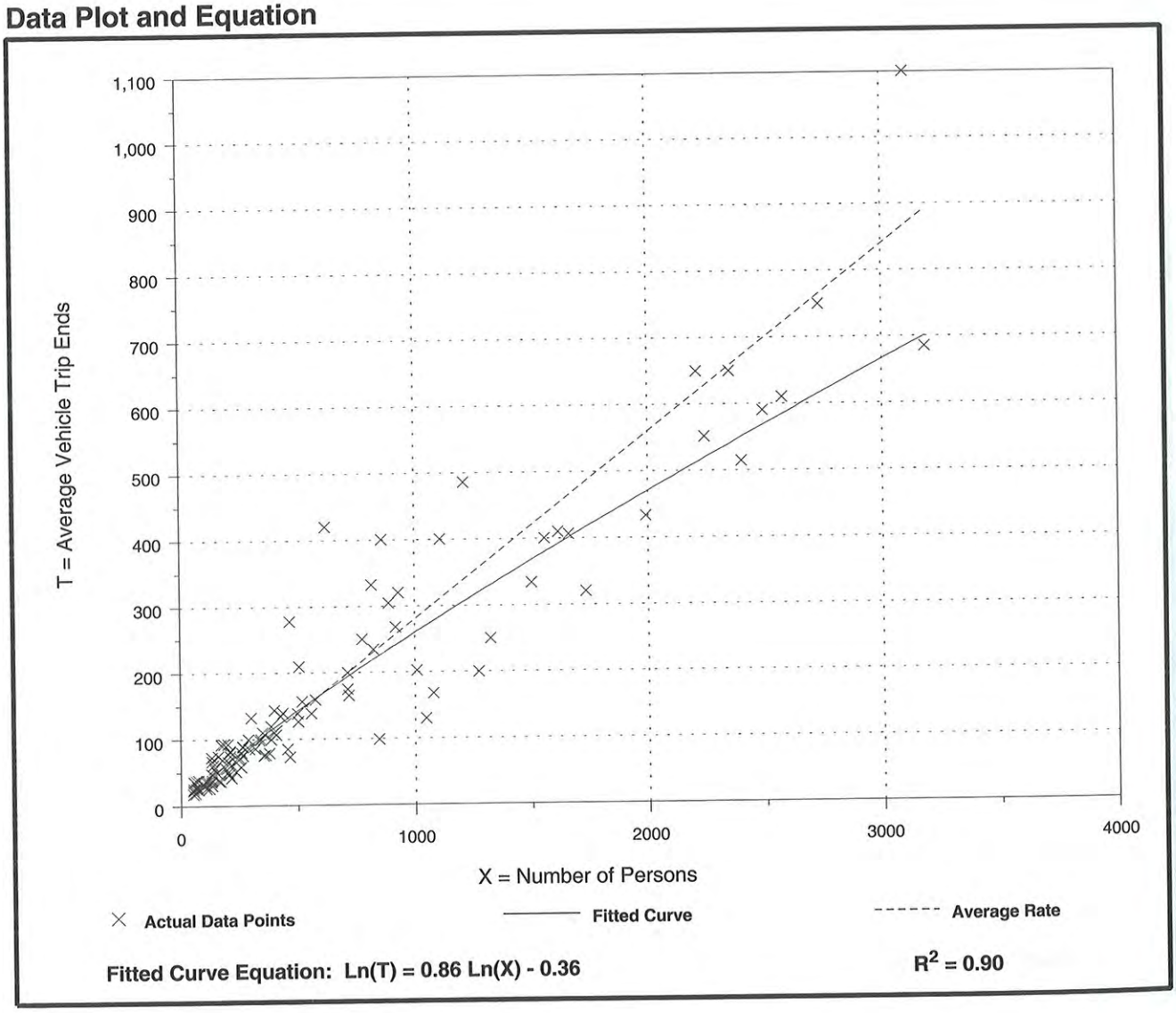
Average Vehicle Trip Ends vs: Persons
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 111
Average Number of Persons: 629
Directional Distribution: 66% entering, 34% exiting

Trip Generation per Person

Average Rate	Range of Rates	Standard Deviation
0.28	0.12 - 0.68	0.53

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.86 Ln(X) - 0.36

R^2 = 0.90

APPENDIX D

Projected Conditions Capacity Analysis

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	52	126	8	48	120
Peak Hour Factor	0.50	0.84	0.84	0.50	0.67	0.74
Hourly flow rate (vph)	10	62	150	16	72	162
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	455	150			150	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	455	150			150	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	93			95	
cM capacity (veh/h)	538	891			1444	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	72	150	16	72	162
Volume Left	10	0	0	72	0
Volume Right	62	0	16	0	0
cSH	1035	1700	1700	1444	1700
Volume to Capacity	0.07	0.09	0.01	0.05	0.10
Queue Length 95th (m)	1.8	0.0	0.0	1.3	0.0
Control Delay (s)	9.7	0.0	0.0	7.6	0.0
Lane LOS	A			A	
Approach Delay (s)	9.7	0.0		2.3	
Approach LOS	A				

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	56	241	5	46	206
Peak Hour Factor	0.50	0.63	0.73	0.38	0.66	0.90
Hourly flow rate (vph)	10	89	330	13	70	229
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	698	330			330	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	698	330			330	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	97	87			94	
cM capacity (veh/h)	386	700			1224	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	99	330	13	70	229
Volume Left	10	0	0	70	0
Volume Right	89	0	13	0	0
cSH	779	1700	1700	1224	1700
Volume to Capacity	0.13	0.19	0.01	0.06	0.13
Queue Length 95th (m)	3.5	0.0	0.0	1.4	0.0
Control Delay (s)	11.3	0.0	0.0	8.1	0.0
Lane LOS	B			A	
Approach Delay (s)	11.3	0.0		1.9	
Approach LOS	B				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	28	248	144	23	175	137
Peak Hour Factor	0.50	0.84	0.84	0.50	0.67	0.74
Hourly flow rate (vph)	56	295	171	46	261	185
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	879	171			171	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	879	171			171	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	66			82	
cM capacity (veh/h)	262	867			1418	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	351	171	46	261	185
Volume Left	56	0	0	261	0
Volume Right	295	0	46	0	0
cSH	1032	1700	1700	1418	1700
Volume to Capacity	0.34	0.10	0.03	0.18	0.11
Queue Length 95th (m)	12.2	0.0	0.0	5.4	0.0
Control Delay (s)	13.1	0.0	0.0	8.1	0.0
Lane LOS	B			A	
Approach Delay (s)	13.1	0.0		4.7	
Approach LOS	B				

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	22	193	276	27	227	236
Peak Hour Factor	0.50	0.63	0.73	0.38	0.66	0.90
Hourly flow rate (vph)	44	306	378	71	344	262
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1328	378			378	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1328	378			378	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	64	53			71	
cM capacity (veh/h)	122	658			1175	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	350	378	71	344	262
Volume Left	44	0	0	344	0
Volume Right	306	0	71	0	0
cSH	752	1700	1700	1175	1700
Volume to Capacity	0.47	0.22	0.04	0.29	0.15
Queue Length 95th (m)	19.9	0.0	0.0	9.8	0.0
Control Delay (s)	19.6	0.0	0.0	9.3	0.0
Lane LOS	C			A	
Approach Delay (s)	19.6	0.0		5.3	
Approach LOS	C				

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	107	878	177	52	414	168
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	954	192	57	450	183
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1275	192			192	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1275	192			192	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	8	0			68	
cM capacity (veh/h)	126	844			1393	

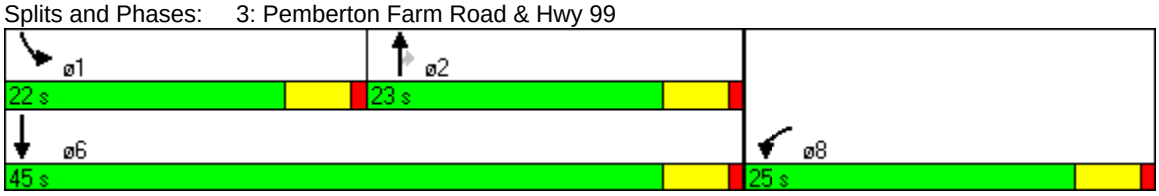
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	1071	192	57	450	183
Volume Left	116	0	0	450	0
Volume Right	954	0	57	0	0
cSH	777	1700	1700	1393	1700
Volume to Capacity	1.38	0.11	0.03	0.32	0.11
Queue Length 95th (m)	364.5	0.0	0.0	11.3	0.0
Control Delay (s)	195.5	0.0	0.0	8.8	0.0
Lane LOS	F			A	
Approach Delay (s)	195.5	0.0		6.3	
Approach LOS	F				

Intersection Summary			
Average Delay	109.2		
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1805	1553	1743	1292	3502	1727
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1553	1743	1292	3502	1727
Satd. Flow (RTOR)		877		57		
Volume (vph)	107	878	177	52	414	168
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	9%	25%	0%	10%
Lane Group Flow (vph)	116	954	192	57	450	183
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phases	8		2	2	1	6
Minimum Initial (s)	7.0		10.0	10.0	6.0	10.0
Minimum Split (s)	21.0		21.0	21.0	11.0	21.0
Total Split (s)	25.0	0.0	23.0	23.0	22.0	45.0
Total Split (%)	35.7%	0.0%	32.9%	32.9%	31.4%	64.3%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		Min	Min	None	Min
Act Effct Green (s)	9.8	41.7	13.4	13.4	12.0	32.3
Actuated g/C Ratio	0.21	1.00	0.32	0.32	0.29	0.77
v/c Ratio	0.30	0.61	0.34	0.13	0.45	0.14
Control Delay	19.5	1.8	16.4	6.2	15.5	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	1.8	16.4	6.2	15.5	3.8
LOS	B	A	B	A	B	A
Approach Delay	3.7		14.1			12.1
Approach LOS	A		B			B

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 41.7	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 7.8	Intersection LOS: A
Intersection Capacity Utilization 37.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Pemberton Farm Road & Hwy 99



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	80	658	339	119	967	289
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	715	368	129	1051	314
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2785	368			368	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2785	368			368	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	0	0			11	
cM capacity (veh/h)	2	666			1185	

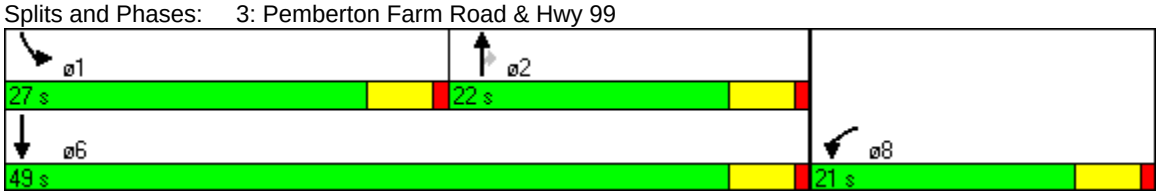
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	802	368	129	1051	314
Volume Left	87	0	0	1051	0
Volume Right	715	0	129	0	0
cSH	21	1700	1700	1185	1700
Volume to Capacity	37.60	0.22	0.08	0.89	0.18
Queue Length 95th (m)	Err	0.0	0.0	105.5	0.0
Control Delay (s)	Err	0.0	0.0	25.8	0.0
Lane LOS	F			D	
Approach Delay (s)	Err	0.0		19.8	
Approach LOS	F				

Intersection Summary			
Average Delay	3019.7		
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1805	1509	1696	1615	3400	1810
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1509	1696	1615	3400	1810
Satd. Flow (RTOR)		715		100		
Volume (vph)	80	658	339	119	967	289
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	7%	12%	0%	3%	5%
Lane Group Flow (vph)	87	715	368	129	1051	314
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phases	8		2	2	1	6
Minimum Initial (s)	7.0		10.0	10.0	6.0	10.0
Minimum Split (s)	21.0		21.0	21.0	11.0	21.0
Total Split (s)	21.0	0.0	22.0	22.0	27.0	49.0
Total Split (%)	30.0%	0.0%	31.4%	31.4%	38.6%	70.0%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		Min	Min	None	Min
Act Effct Green (s)	9.7	57.2	16.8	16.8	21.7	44.1
Actuated g/C Ratio	0.16	1.00	0.29	0.29	0.38	0.77
v/c Ratio	0.30	0.47	0.74	0.24	0.82	0.23
Control Delay	26.2	1.1	31.7	8.0	24.5	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.2	1.1	31.7	8.0	24.5	3.6
LOS	C	A	C	A	C	A
Approach Delay	3.8		25.6			19.7
Approach LOS	A		C			B

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 57.2	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 61.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Pemberton Farm Road & Hwy 99



APPENDIX E

Site Plan

GEMS School

Future Ravens Crest
Residential Neighbourhood

Edge of Ravens Crest Property

Existing Railway Line

Recreation Centre
Final configuration to be confirmed

Tennis
Baseball
Soccer
Track
Soccer
Football
Softball
Soccer
22.
23
12.

New Storm Water Pond

School Farm Garden

Existing Neighbourhood

Road to Pemberton

Forest

Existing Wetlands

Existing Forest

Hay Field

Hay Field

Hay Field

New Irrigation Pond

Existing Storm Ditch

Hay Fields

New Trees

Farm Access

To Town of Mt. Currie

Friendship Trail

Edge of Ravens Crest Property

Equestrian Centre

1. Temporary School Building
2. Temporary Gym and Auditorium
3. Main School Entry and Administration
4. Gymnasium
5. Auditorium and Physical Plant
6. Workshops/Labs
7. Classrooms
8. Dining Hall
9. Residential Wings
10. Bridge
11. Future Soccer / Playing Field
12. Grass Paver Parking Field
13. Entrance Drive way
14. Existing Farm Crossing
15. Outdoor Assembly area / Open Field
16. Horse Stables
17. Hay Barn
18. Indoor Riding Area
19. Tack Room and Gathering Room
20. Outdoor Riding Area
21. New Riding Trail
22. Indoor Ice Rink
23. Indoor Swimming Pool

N

0 100 200 300 400 500 600 700 m